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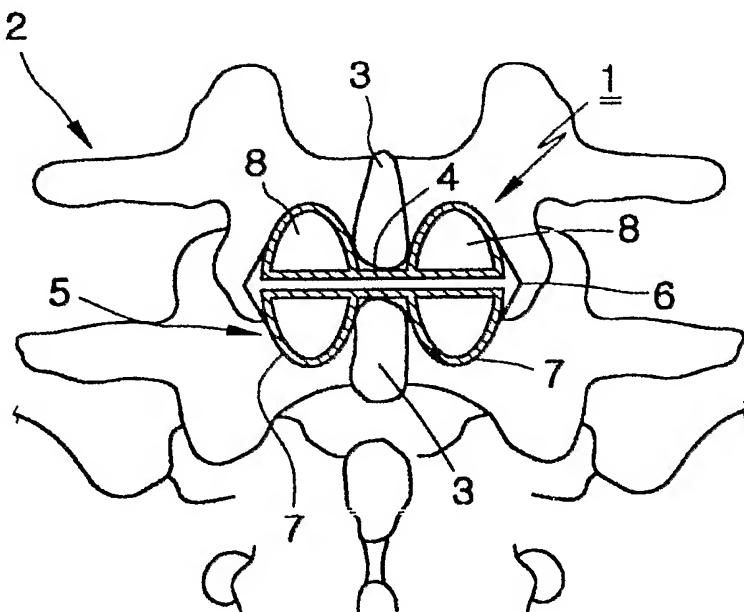
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(54) Title: PROSTHESIS FOR VERTEBRA



(57) Abstract: Disclosed is a prosthesis to be inserted between the spinous processes of the vertebra for preventing back pain, arthritis and neuralgia, caused by excessive movement of the vertebra that have degenerated. The prosthesis is capable of being implanted percutaneously through a tube such as an endoscope, thereby reducing the size of a scar generated after a surgical operation, preventing muscle damage, and preserving the interspinous ligaments. The prosthesis (1), which is capable of restraining movement in the vertebral segments when the torso extends backward at the waist by being inserted between the vertebral spinous processes, includes a spacing part (4) to be placed between upper and lower spinous processes (3); and buckling parts (5) provided at both ends of the spacing part to prevent the prosthesis from being removed, wherein, a reinforcement part (6) is selectively provided at the spacing part and the buckling parts.

**DESCRIPTION****PROSTHESIS FOR VERTEBRA****Technical Field**

The present invention relates, in general, to a prosthesis to be inserted between the spinous processes of the vertebra. More particularly, the present invention relates to a prosthesis to be inserted between the spinous processes of the vertebra for preventing back pain, arthritis and neuralgia that develops due to compressed nerves, which are caused by excessive movement of the vertebra with a degenerative change, wherein the prosthesis is capable of being percutaneously inserted through a narrow tube such as an endoscope while not requiring a large incision to expose the whole area of a site where the prosthesis is to be implanted, thereby reducing the size of a scar generated after a surgical operation, preventing muscle damage, and preserving the interspinous ligaments.

**Background Art**

Typically, when a person bends forward at the waist and fully extends, movement occurs in the vertebral segments.

The movement of healthy vertebra occurs in a limited range. However, when degeneration occurs with age,

excessive movement occurs in the vertebral segments, causing back pain, arthritis and neuralgia due to compressed nerves.

These pains can be prevented by implanting a 5 prosthesis in the vertebral spinous process to restrain the excessive movement.

However, since conventional prostheses for restraining excessive movement are inserted after a large incision is made to expose the whole area of a site where 10 the prosthesis is to be implanted, a large scar remains after a surgical operation, and injuries such as muscle damage often occur during the operation. In this regard, there is an urgent need for the development of prostheses capable of resolving these problems.

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#### **Description of Drawings**

Fig. 1 is a top plane view showing a state at which a prosthesis of the present invention is implanted;

Fig. 2 is a lateral sectional view showing a state at which a prosthesis of the present invention is implanted;

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Fig. 3 is a schematic view for describing the function and action principle of a prosthesis according to the present invention;

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Fig. 4 is a sectional view showing another embodiment of a spacing part of a prosthesis according to the present invention;

Figs. 5, 6 and 7 are sectional views showing several variations in the shape of a prosthesis according to the present invention;

5 Figs. 8, 9 and 10 are sectional views showing several variations in a reinforcement part of a prosthesis according to the present invention;

Figs. 11 and 12 are sectional views of a prosthesis comprising at each end a buckling part that includes a expandable body according to the present invention;

10 Fig. 13 is a sectional view of a prosthesis comprising at each end a buckling part that includes a expandable body containing capsules according to the present invention;

15 Fig. 14 is a sectional view of a prosthesis comprising at each end a buckling part that includes a expandable body having a partition according to the present invention;

20 Fig. 15 is a sectional view of a prosthesis comprising at each end a buckling part that includes a expandable body into which a material is externally injectable according to the present invention;

Figs. 16 and 17 are sectional views of a prosthesis comprising at each end a buckling part that contains a coil spring in the chamber according to the present invention;

25 Figs. 18 and 19 are a front view and a lateral view of a prosthesis comprising at each end a buckling part that

includes radial-type elastic fins according to the present invention;

5 Fig. 20 is a sectional view showing application of a buckling part including radial-type elastic fins according to the present invention to a desired site of the body according to the present invention;

10 Figs. 21 and 22 are a front view and a lateral view of a prosthesis comprising at each end a buckling part that includes spiral spring-type elastic fins according to the present invention;

15 Figs. 23 and 24 are an exploded front view and an assembled enlarged view of a prosthesis comprising at its ends buckling parts that are assembled in an insertion-locking manner to be expanded according to the present invention;

Figs. 25 and 26 are an exploded front view and an assembled enlarged view of a prosthesis comprising at its ends buckling parts that are assembled in a nut-locking manner to be expanded according to the present invention;

20 Figs. 27 and 28 are lateral views showing initial (removable) and rotated (irremovable) states, respectively, of a prosthesis comprising at each end a buckling part having an elliptical shape; and

25 Figs. 29 to 34 are sectional views showing a process of implanting a prosthesis 1, comprising buckling parts of various forms according to the present invention, between

the spinous processes of the vertebra.

<Description of the elements in the drawings>

	1: Prosthesis	2: Vertebra
	3: Spinous processes	4: Spacing part
5	4a: Chamber	5: Buckling part
	5a: Locking hole	6: Reinforcement part
	7: Expandable body	8: Chamber
	9: Communicating path	10: Capsule
	11: Partition	12: Guide tube
10	13: One-way valve	14: Coil spring
	15: Elastic fins	16: Insertion tube
	17: Locking tube	18: Outer threads
	19: Connection rod	19a: Locking protrusions
	20: Nut	21: Needle
15	22: Wire	23: Incision dilator

**Disclosure**

**Technical Problem**

Therefore, it is an object of the present invention to provide a prosthesis to be inserted between the spinous processes of the vertebra, which is capable of overcoming the problems encountered in the conventional prostheses requiring large incision.

**Technical Solution**

In order to accomplish the above objects, the present invention provides a prosthesis to be inserted between the spinous processes of the vertebra through a insertion tube 5 while providing immobilizing method like buckling parts. Consequently, it does not require a large incision, thereby reducing the size of a scar generated after a surgical operation, preventing muscle damage, and preserving the interspinous ligaments.

10

**Advantageous Effects**

The prosthesis 1 to be inserted between the spinous processes of the vertebra, provided by the present invention, prevents the vertebra from excessively extending backwards between the spinous processes of the vertebra.

15

In particular, the prosthesis 1 of the present invention is capable of being applied percutaneously while not requiring a large incision, thereby reducing the size of the scar, preventing muscle damage, and preserving the interspinous ligaments.

20

**Best Mode**

The prosthesis 1 having various components provided by the present invention is surgically implanted between spinous processes 3 of the vertebra by a series of steps, as shown in Figs. 29 to 34.

That is, when the patient is in prone position, a long needle 21 is inserted between the spinous processes 3 of interest, and a guide wire 22 is inserted through the needle 21. After the needle 21 is removed, an incision 5 dilator 23 is inserted along the wire 22 to provide a tract for prosthesis insertion.

After the incision dilator 23 is drawn out, an insertion tube 16 is put into the tract, and the wire 22 is removed. Then, the prosthesis 1 of the present invention is 10 inserted between the spinous processes through the insertion tube, and immobilized with a buckling part 5 to prevent it from being removed.

The prosthesis 1 which is inserted between the spinous processes by the above-mentioned process will be 15 described in more detail below.

Fig. 1 is a top plane view of the vertebra, where the prosthesis 1 is to be inserted between the spinous processes of the vertebra according to the present invention, and Fig. 2 is a lateral sectional view of the site. Referring to Figs. 1 and 2, the present invention 20 will be described in detail as follows.

The prosthesis 1 of the present invention is characterized by requiring only a small stab incision. To achieve this feature, the present invention is inserted 25 through an insertion tube 16 between the spinous processes 3 of the vertebra 2, restricting extension movement of the

vertebral segment.

That is, the prosthesis 1 comprises a spacing part 4 that is composed of an elastic material (e.g., rubber materials, silicon, etc.) or a hard material (e.g., synthetic resins, etc.) to prevent the distance between an upper and lower spinous processes 3 from being shortened when inserted between the spinous processes 3; and buckling parts 5 provided at both ends of the spacing part 4 to prevent the spacing part 4 from being removed from between the spinous processes 3.

As shown in Fig. 4, the spacing part 4 may include a chamber (4a) that contains a gas or a liquid therein to increase cushioning ability.

As shown in Fig. 3, the buckling parts 5 are flexible so that they enter between the spinous processes 3 even by weak force and are caught by the spinous processes 3. The buckling parts 5 may be formed in a variety of shapes including a mountain shape and a spherical shape, as shown in Figs. 5 to 7.

When the prosthesis 1 is made of a material with high flexibility, such as a rubber material, it is difficult to handle due to its friable property during the surgical manipulation. In this regard, to reinforce or increase the rigidity of the buckling parts 5, as shown in Figs. 8 to 10, a reinforcement part 6 with a different elasticity may be added in the spacing part 4 and the buckling parts 5,

formed in only an end of the buckling parts 5, or formed in both the spacing part 4 and an end of the buckling parts 5.

On the other hand, as shown in Figs. 11 and 12, the buckling parts 5 may be formed to swell following its 5 insertion to further secure its immobilization effect.

That is, a expandable body 7 is provided outside the reinforcement part 6 of each of the buckling parts 5 comprising the prosthesis 1 to define internal chambers 8 that contain a liquid with a boiling point lower than the 10 temperature of the body, such as ethyl ether.

In the case of using ethyl ether which has a boiling point of 34°C, the prosthesis 1 is stored in a refrigerator until use, and, when a surgical operation is to be carried out, is taken from the refrigerator and implanted. Shortly 15 after insertion, the ethyl ether warmed by the body temperature is transformed into a gas. The buckling parts 5 swell at both ends by the generated gas, thereby more effectively preventing the prosthesis 1 from being removed from the site.

20 Referring to Fig. 13 showing another embodiment of the buckling parts 5 each comprising the expandable body 7 to define the chambers 8, the chambers 8 provided in the left and right buckling parts 5 communicate with each other by a communicating path 9 provided in the spacing part 4, 25 and one of the chambers 8 contains capsules 10 capable of rupture under pressure by surgeon's manipulation.

In addition, the chambers 8 and the capsules 10 individually contain a material capable of generating a gas by a chemical reaction (material A + material B = product C + product D). After a surgical operation, the capsules 10 5 rupture (burst) under pressure within the chamber to release reacting materials, and the released materials react with each other to generate a gas to swell the expandable body 7. Alternatively, the chambers 8 each containing the capsules 10 do not communicate with each other by the 10 communicating path 9 but are formed independently from each other. In this case, the capsules 10 are introduced into each of the left and right chambers 8.

In addition, instead of employing the capsules, as shown in Fig. 14, the chambers 8 each have a partition 11 15 to divide the chambers 8 into parts. After implantation between the spinous processes 3, the partition 11 ruptures under pressure by surgeon's manipulation, and contents are released from the parts of the chambers 8 and mixed with each other while reacting with each other to generate a gas 20 to swell the expandable body 7.

The position of the partition 11 may vary depending on the contents. Also, the partition 11 may be formed in each of the chambers.

Referring to Fig. 15, a guide tube 12 is formed in 25 such a way that a material (e.g., a gas, a liquid or a resin) is injected into the chambers 8, and a one-way valve

13 is installed at an inlet of the guide tube 12 to allow inflow of the material while not allowing outflow of the material.

5 In addition, as shown in Fig. 16, 17 the buckling parts 5 are formed in such a way that the chambers 8 each contain a coil spring 14. In this case, immediately after the coil spring 14 is discharged from an insertion tube 16, the chambers 8 each expands due to the coil spring 14 having a restoring elastic property.

10 The chambers 8 may contain a material maintaining a high osmotic pressure to absorb surrounding water to swell the expandable body 7 after a surgical operation.

15 Referring to Figs. 18, 19 and 20 showing a further embodiment of the present invention, each of the buckling parts 5 of the prosthesis 1 comprise multiple elastic fins in radial directions. The buckling part 5 of the elastic fins 15 expands by its own elasticity when discharged from an insertion tube 16 to be prevented from being removed from between the spinous processes 3.

20 Referring to Figs. 21 and 22 showing yet another embodiment of the present invention, the buckling parts 5 each comprise an elastic fins 15 formed in a spiral spring shape. The buckling part 5 comprising the elastic fins 15 also expands by its own elasticity when discharged from an insertion tube 16 to be prevented from being removed from between the spinous processes 3.

Referring to Figs. 23 and 24, a locking tube 17 is formed through the spacing part 4 comprising the prosthesis 1, and each of the buckling parts 5 folded in the insertion tube 16 is pushed by the locking tube 17 to be expanded like an umbrella during the locking procedure. One of the buckling parts 5 is formed on an end of a connection rod 19 having a plurality of locking protrusions 19a at an opposite end. The connection rod 19 having the locking protrusions 19a is inserted into the locking tube 17 formed in the spacing part 4, and then into another locking hole 5a formed in a center of another, separately formed, buckling part 5 to force the locking hole 5a to lock to the locking protrusions 19a, thus expanding the buckling parts 5.

Referring to Figs. 25 and 26, a locking tube 17 is formed through the spacing part 4 comprising the prosthesis 1, and one of the buckling parts 5 is formed on an end of a connection rod 19 having outer threads 18 at an opposite end. The connection rod 19 having the outer threads 18 is inserted into the locking tube 17, and another locking hole 5a formed in a center of separately formed another buckling part 5, and then tightened by a nut 20 to expand the buckling parts 5,

Referring to Figs. 27 and 28, the buckling parts 5 of the prosthesis 1 have an elliptical shape to be prevented from being removed by an about 90° rotation after being

inserted between the spinous processes 3, while the spacing part 4 has a flat shape to prevent further rotation between the spinous processes 3.

**CLAIMS**

1. A prosthesis to be inserted between spinous processes of a vertebra, which is capable of restricting movement of the vertebra when a torso extends backwards at 5 a waist, the prosthesis (1) comprising:

a spacing part (4) to be placed between upper and lower spinous processes (3); and

buckling parts (5) provided at both ends of the spacing part (4) to prevent the prosthesis (1) from being 10 removed,

wherein, a reinforcement part (6) is selectively provided at the spacing part (4) and the buckling parts (5).

2. The prosthesis to be inserted between spinous 15 processes of a vertebra according to claim 1, wherein the buckling parts (5) each comprise an expandable body (7) to define chambers (8) on the reinforcement part (6),

wherein, the chambers (8) contain a liquid with a boiling point lower than a temperature of a human body.

20 3. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the buckling parts (5) each comprise an expandable body (7) to define chambers (8) on the reinforcement part (6),

wherein, the left and right chambers (8) communicate with each other by a communicating path (9) provided in the spacing part (4); one of the chambers (8) contains a capsule (10) capable of rupture under pressure by the 5 surgeon's manipulation; and the chambers (8) and the capsule (10) contain reacting materials capable of generating a gas by a chemical reaction.

4. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the 10 buckling parts (5) each comprise an expandable body (7) to define chambers (8) on the reinforcement part (6),

wherein, each of the left and right chambers (8) contain a capsule (10) capable of rupture under pressure; and the chambers (8) and the capsule (10) contain a 15 material capable of generating a gas by a chemical reaction.

5. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the buckling parts (5) each comprise an expandable body (7) to 20 define chambers (8) on the reinforcement part (6),

wherein, the left and right chambers (8) are communicated with a communicating path (9) provided in the spacing part (4) to allow the contents or pressure of one of the chambers (8) to transfer to an opposite chamber.

6. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the buckling parts (5) each comprise an expandable body (7) to define chambers (8) on the reinforcement part (6),

5                   wherein, the left and right chambers (8) have a partition (11) to divide the chambers (8) into parts; and the divided chambers (8) contain a material capable of generating a gas by a chemical reaction by the rupture of the partition.

10               7. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the buckling parts (5) each comprise an expandable body (7) to define chambers (8) on the reinforcement part (6),

15               wherein, a guide tube (12) is formed at the left and right chambers (8); and an one-way valve (13) is installed at an inlet of the guide tube (12) to inject one selected from among a gas, a liquid and a resin.

20               8. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the buckling parts (5) each comprise an expandable body (7) to define chambers (8) on the reinforcement part (6),

                  wherein, the left and right chambers (8) contain a coil spring (14) therein.

9. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the buckling parts (5) are formed in such a way that an end of a coil spring (14) immobilize the prosthesis at each end of 5 the spacing part (4).

10. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the buckling parts (5) each comprise an expandable body (7) to define chambers (8) on the reinforcement part (6), wherein, the left and right chambers (8) contain a material maintaining a high osmotic pressure to absorb surrounding water to swell the expandable body (7) after a surgical operation.

11. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the buckling parts (5) each comprise a multiple elastic fins (15) in radial directions,

wherein the elastic fins of the buckling part (5) expands by its own elasticity when discharged from an 20 insertion tube (16) to be prevented from being removed from between the spinous processes (3).

12. The prosthesis to be inserted between spinous

processes of a vertebra according to claim 1, wherein the buckling parts (5) each comprise an elastic fins(15) formed in a spiral spring shape,

5       wherein the buckling part (5) of the elastic fins(body) (15) expands by its own elasticity when discharged from an insertion tube (16) to be prevented from being removed from between the spinous processes (3).

10       13. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein a locking tube (17) is formed through the spacing part (4), and one of the buckling parts (5) is formed on an end of a connection rod (19) having a plurality of locking protrusions (19a) at an opposite end,

15       wherein, the connection rod (19) having the locking protrusions (19a) is inserted into the locking tube (17), and then into another locking hole (5a) formed in a center of another, separately formed, buckling part (5), thus pushing the folded buckling parts (5) to open and to expand.

20       14. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein a locking tube (17) is formed through the spacing part (4), and one of the buckling parts (5) is formed on an end of a connection rod (19) having outer threads (18) at an

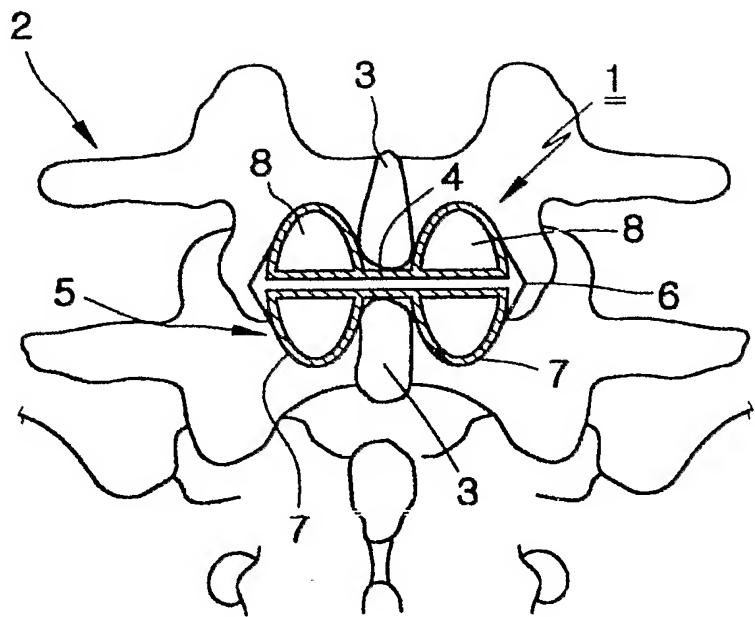
opposite end,

wherein, the connection rod (19) having the outer threads (18) is inserted into the locking tube (17), and another locking hole (5a) formed in a center of another, 5 separately formed, buckling part (5), and then tightened by a nut (20) to push initially folded buckling parts (5) to open and to expand.

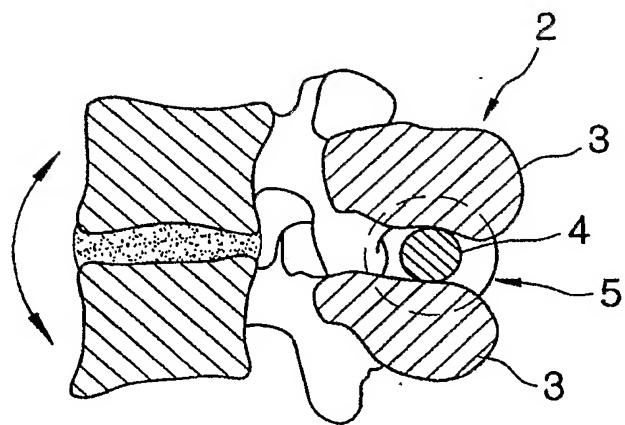
15. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the 10 buckling parts (5) have an elliptical shape to be prevented from being removed by a rotation after the spacing part (4) is inserted between the spinous processes (3), while spacing part 4 has the flat shape to prevent free rotation of the prosthesis between the spinous process.

15 16. The prosthesis to be inserted between spinous processes of a vertebra according to claim 1, wherein the spacing part (4) comprises a chamber (4a) that contains therein one selected from among a gas and a liquid to increase cushioning ability.

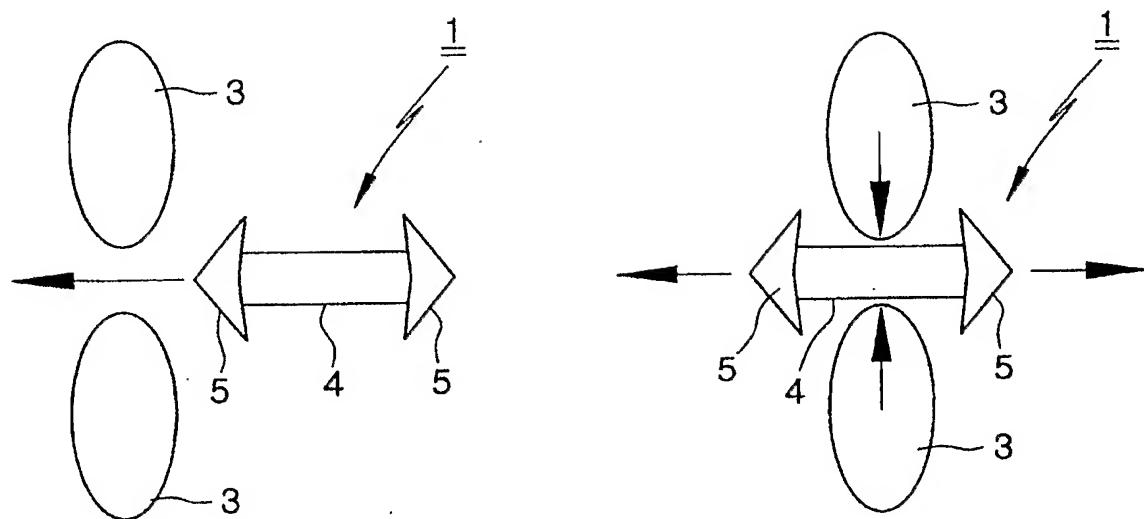
【Fig.1】



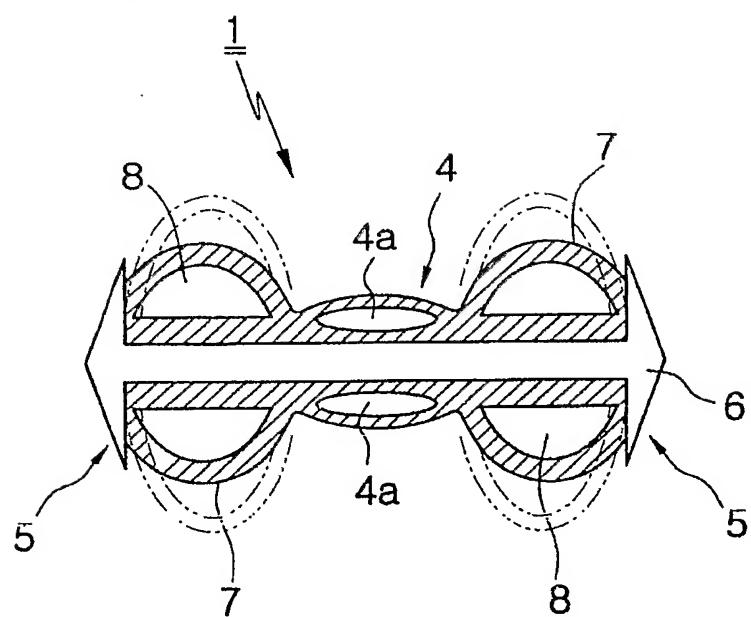
【Fig. 2】



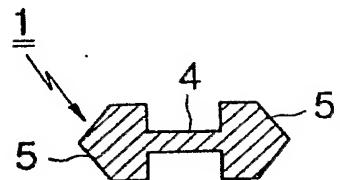
【Fig. 3】



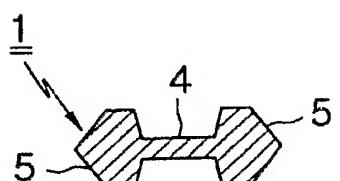
【Fig. 4】



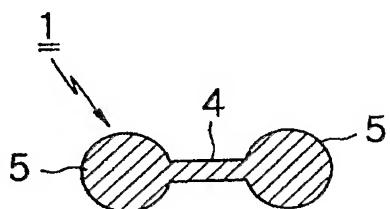
【Fig. 5】



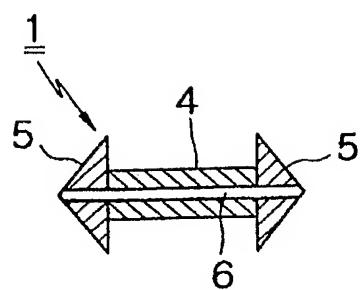
【Fig. 6】



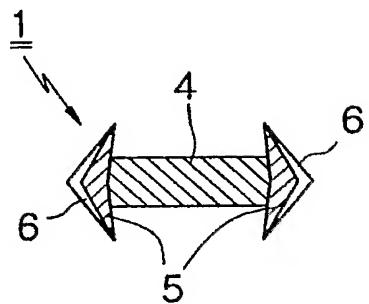
【Fig. 7】



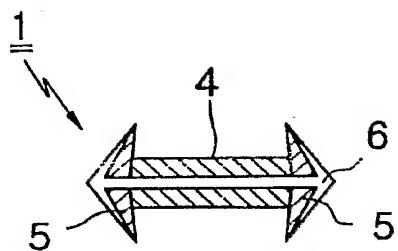
【Fig. 8】



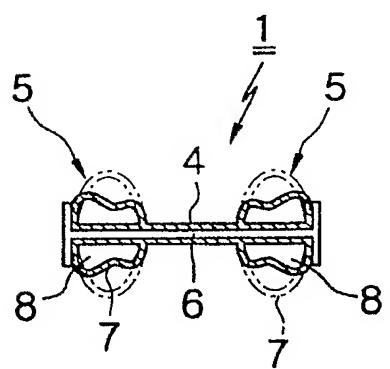
【Fig. 9】



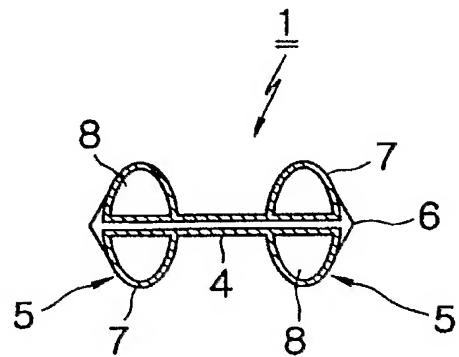
【Fig. 10】



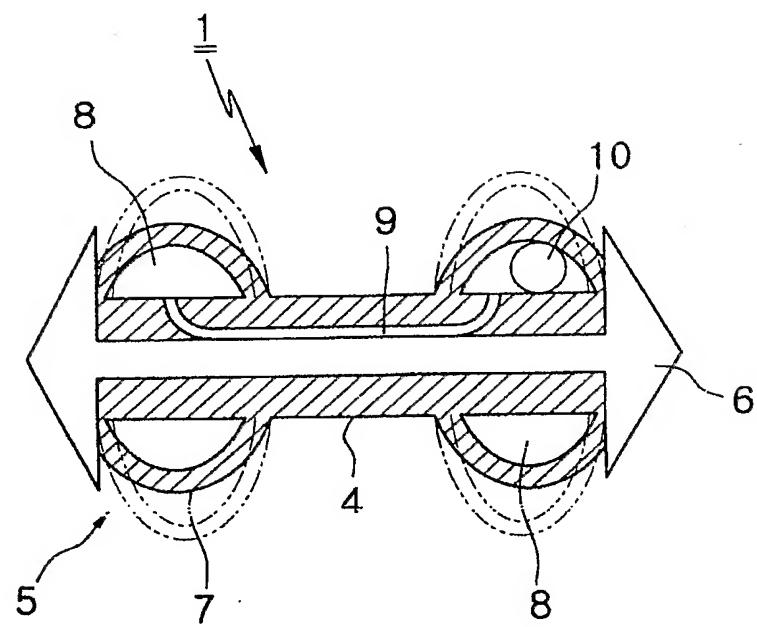
【Fig. 11】



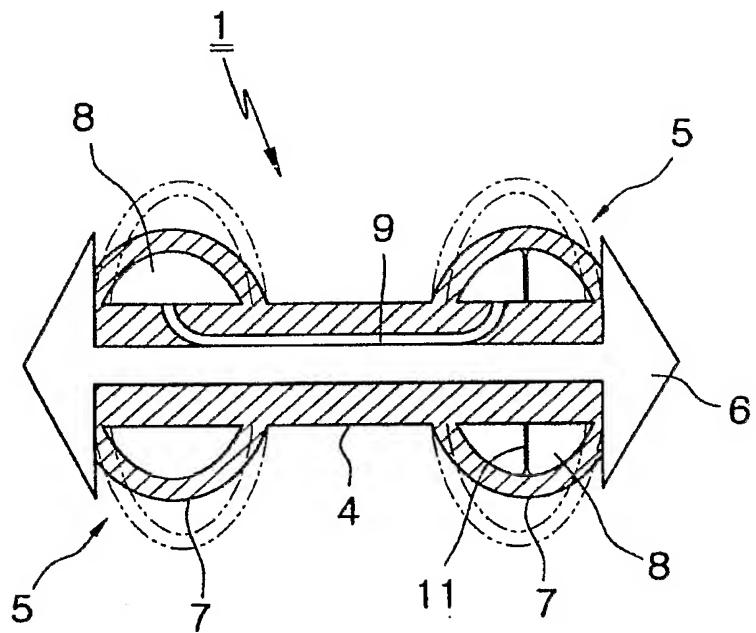
【Fig. 12】



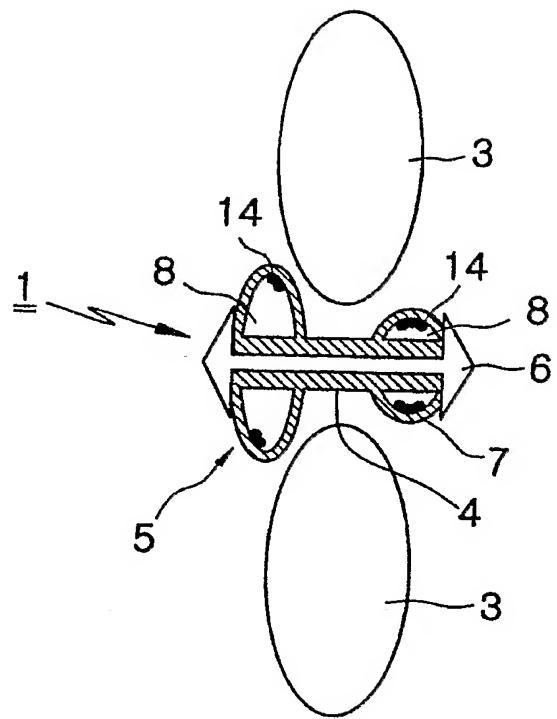
【Fig. 13】



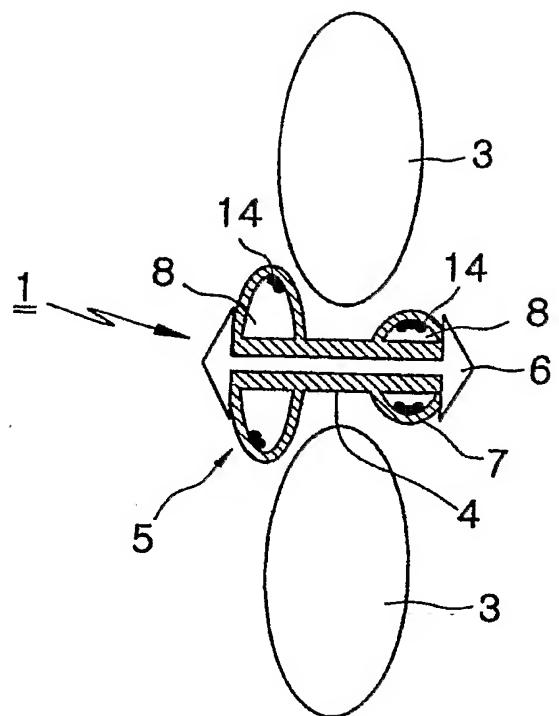
【Fig. 14】



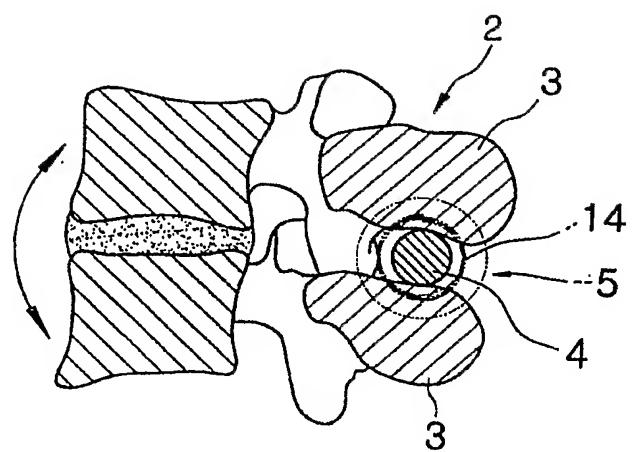
【Fig. 15】



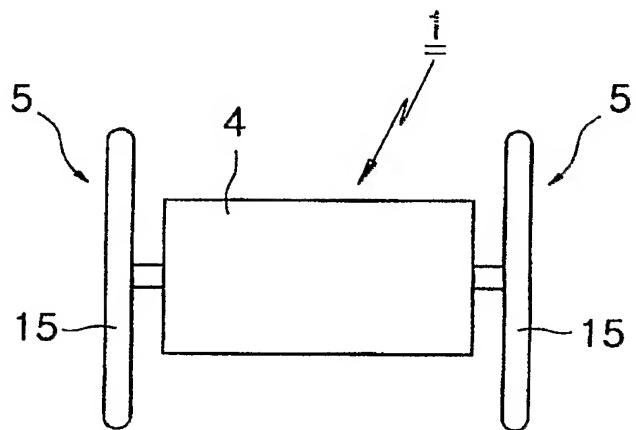
【Fig. 16】



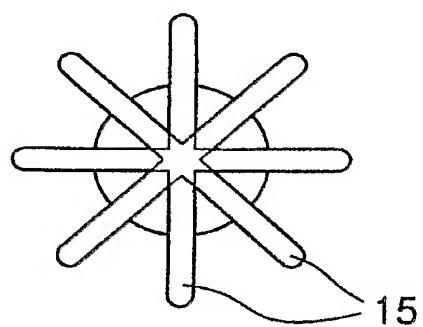
【Fig. 17】



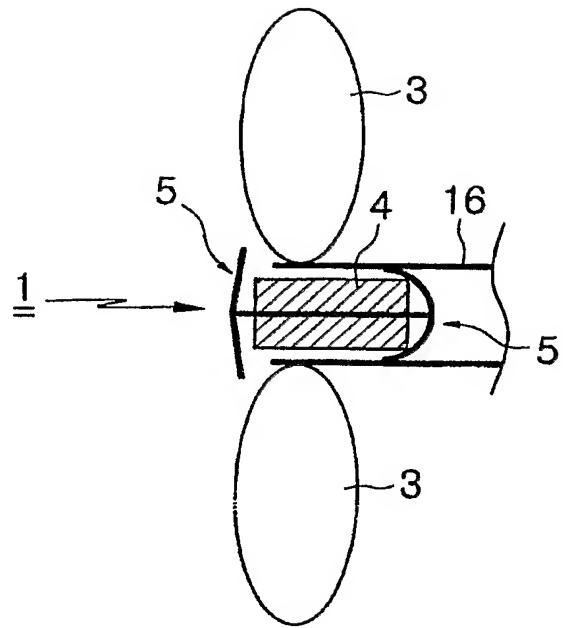
【Fig. 18】



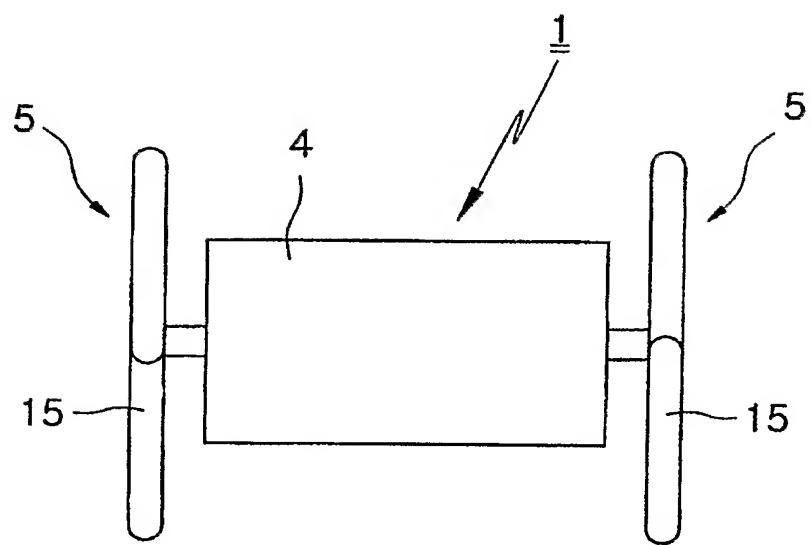
【Fig. 19】



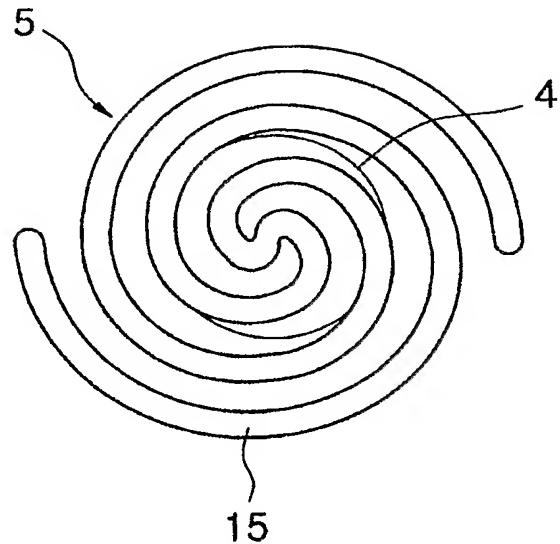
【Fig. 20】



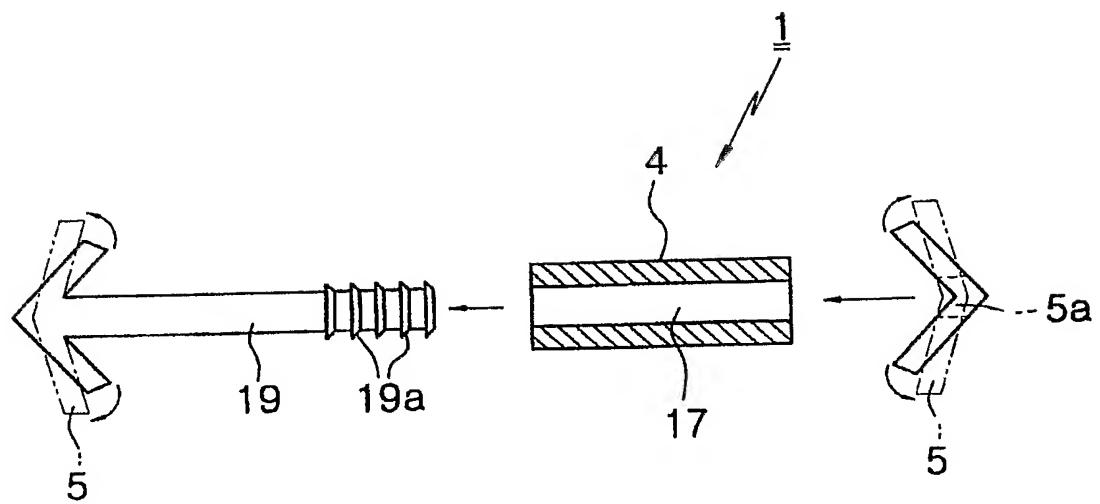
【Fig. 21】



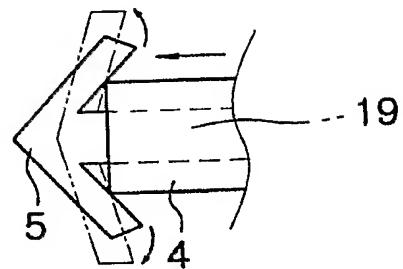
[Fig. 22]



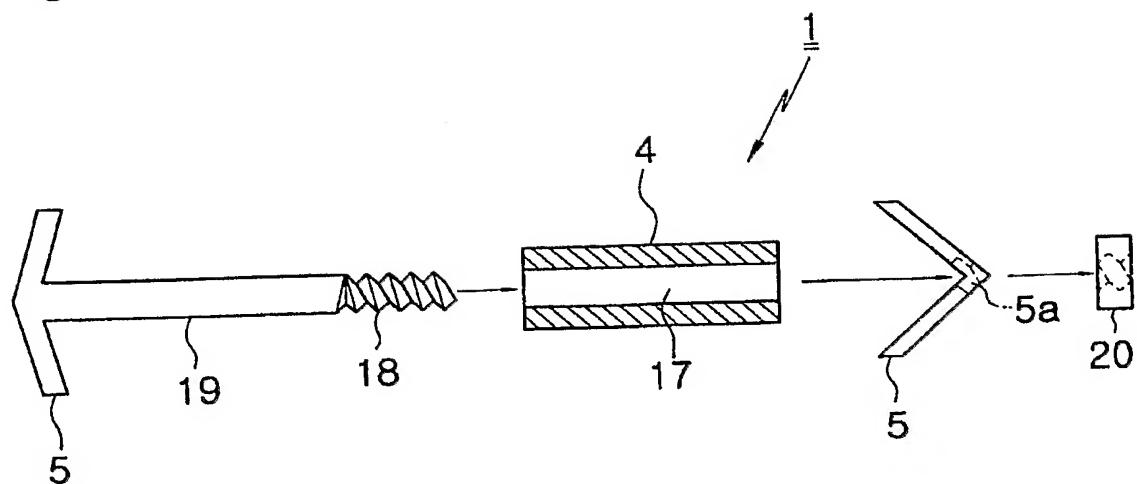
[Fig. 23]



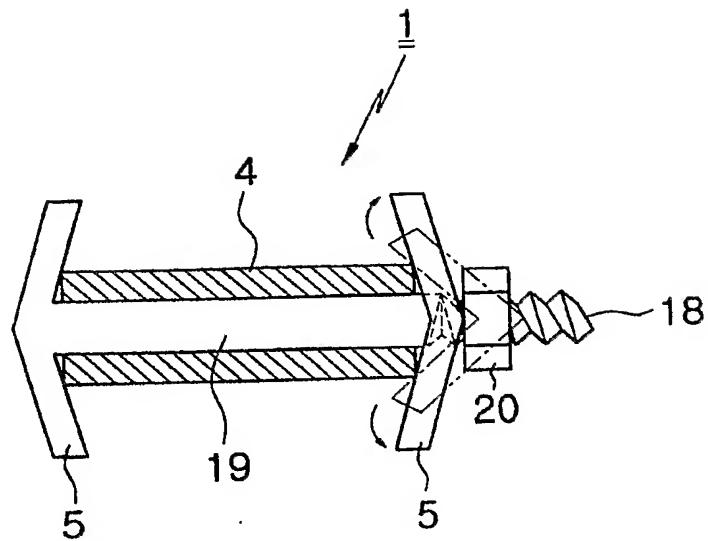
【Fig. 24】



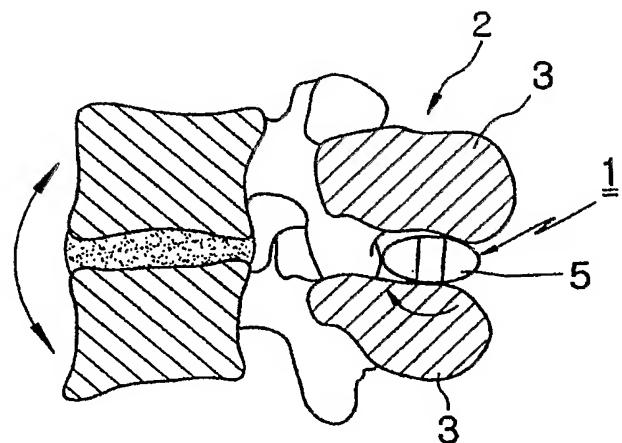
【Fig. 25】



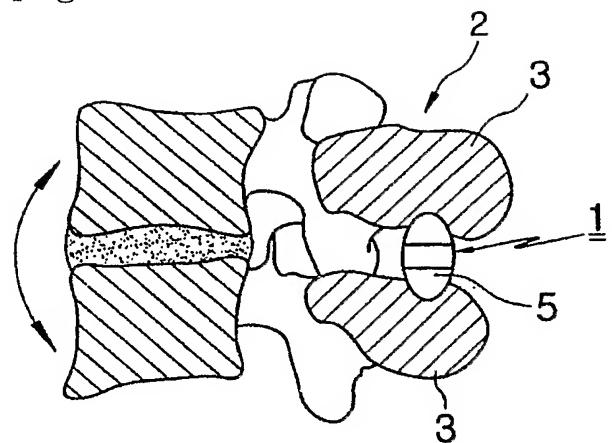
【Fig. 26】



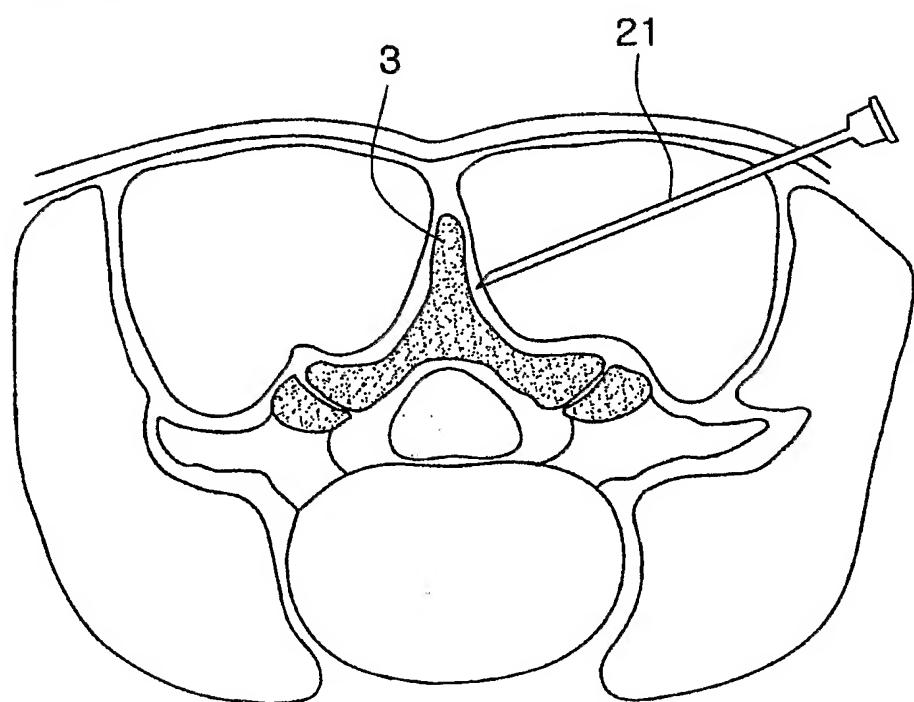
【Fig. 27】



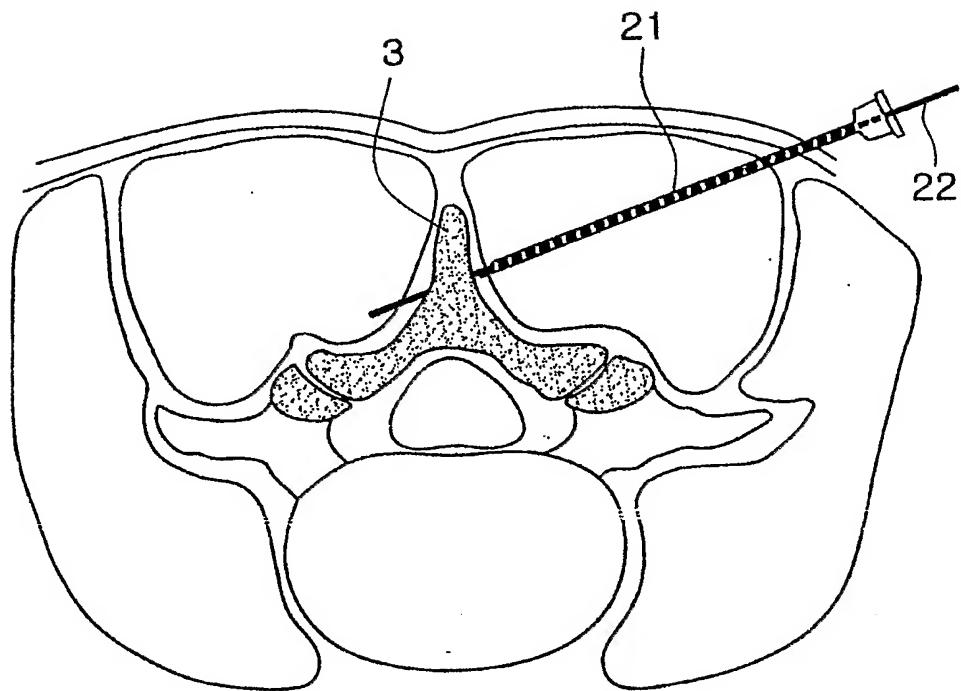
【Fig. 28】



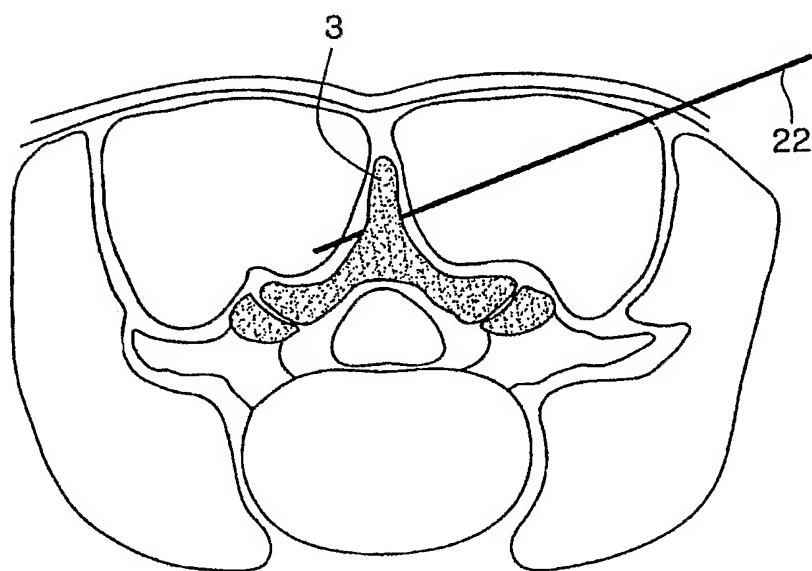
【Fig. 29】



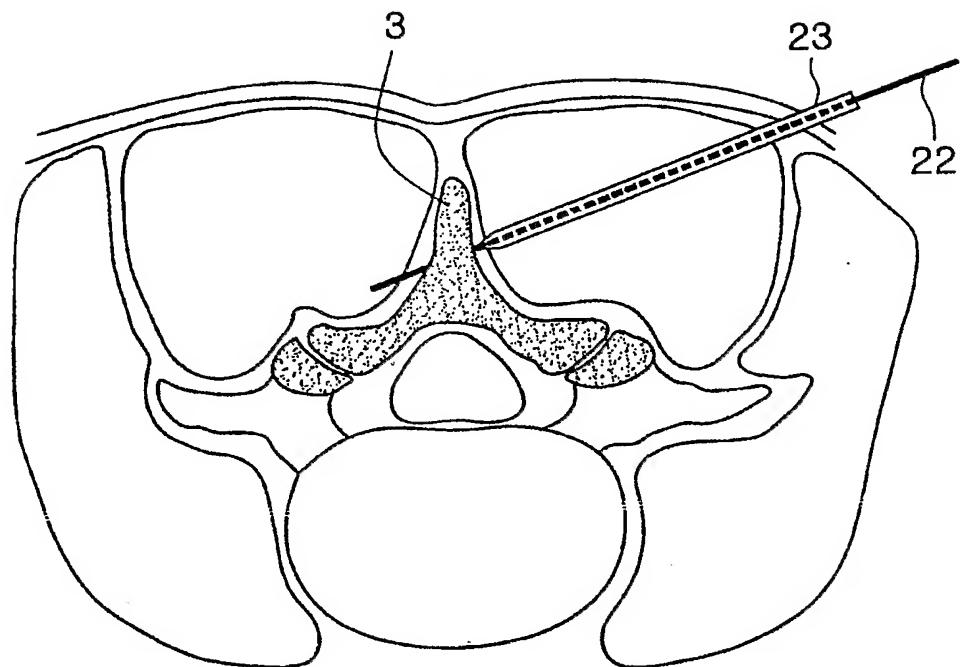
【Fig. 30】



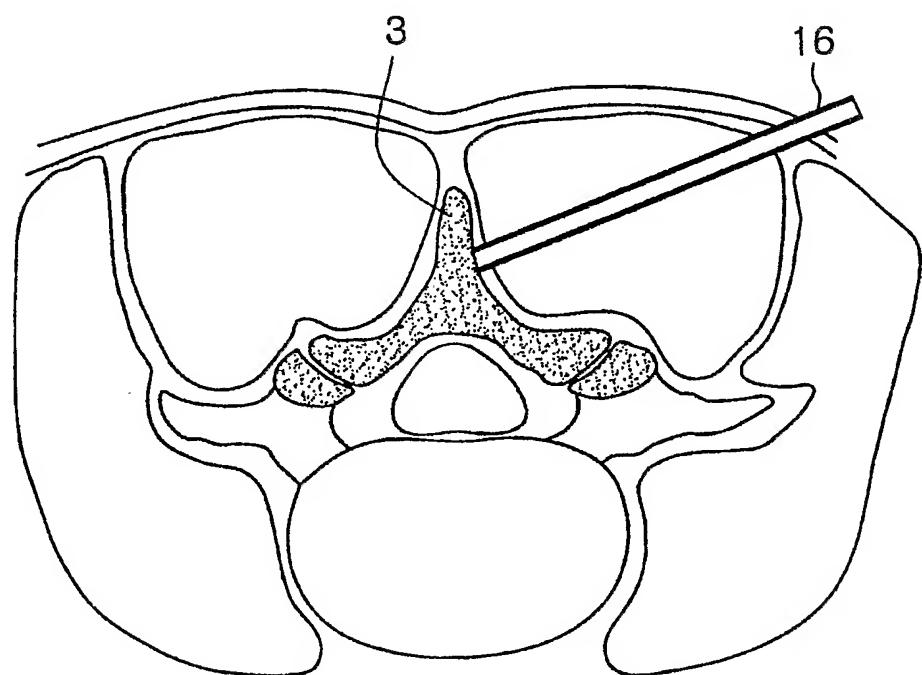
【Fig. 31】



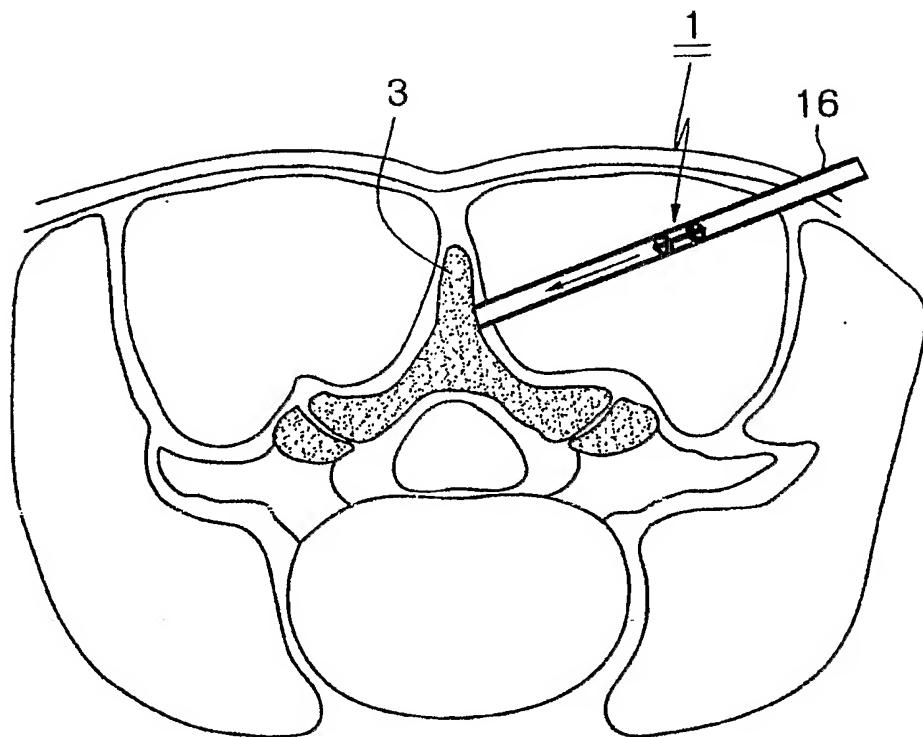
【Fig. 32】



【Fig. 33】



【Fig. 34】



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/KR2004/001224

## A. CLASSIFICATION OF SUBJECT MATTER

**IPC7 A61F 2/44, A61F 2/28, A61F 2/30, A61B 17/56, 17/70**

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 A61F 2/44, 2/28, 2/30, A61B 17/56, 17/70

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Korean patents and applications since 1975.

Korean utility models and applications since 1975.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
eKIPASS, CA CD, E-SPACENET

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99/42051 A1 (TAYLOR) 26 August 1999 (26-08-1999) See the whole document	1-16
A	US 2001/0039452 A1 (Zucherman et al.) 08 November 2001 (08-11-2001) See the whole document	1-16
A	US 5 609 634 A (Voydeville) 11 March 1997 (11-03-1997) See the whole document	1-16
A	US 5 645 599 A (Samani) 08 July 1997 (08-07-1997) See the whole document	1-16
A	US 6 440 169 B1 (Elberg et al.) 27 August 2002 (27-08-2002) See the whole document	1-16
A	WO 03/045262 A2 (SPINE NEXT) 05 June 2003 (05-06-2003) See the whole document	1-16
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 Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search  
20 SEPTEMBER 2004 (20.09.2004)Date of mailing of the international search report  
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**INTERNATIONAL SEARCH REPORT**  
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